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UNITED STATES PATENT APPLICATION

OF

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FOR

METHOD AND CONCENTRATED COMPOSITION
FOR INSECT AND ANIMAL CONTROL

DO NOT PUBLISH

BACKGROUND OF THE INVENTION

The present invention relates to insect and animal control compositions and insect repellent compositions effective against iris borers, other borers, and sucking or chewing insects, and animal repellent compositions especially effective against deer, elk, squirrels, chipmunks, rodents, rabbits and other warm-blooded mammals browsing on ornamental plants, trees and non-food crops. The invention also provides a method for insect and animal control utilizing the composition. The composition is a concentrated water-based formulation.

In one aspect, the invention is directed to insect control and the invention is described by way of illustrative application as a deterrent or control for iris borers for which there is presently no satisfactory means of control apart from the method and composition disclosed and claimed in co-pending application Serial No. 832624 filed April 11, 2001.

Iris borers have a particularly destructive effect on irises and are highly detrimental to cost and labor invested in irises by growers and gardeners. Iris growers regard the iris borer as the biggest problem to be faced in growing irises in North America and other countries. The Cooperative Extension Institute of

Agriculture and Natural Resources of the University of Nebraska states that the iris borer is the most serious insect pest of iris in Nebraska and is found virtually everywhere in the state.

The life cycle of iris borers includes four stages: egg, larva (borer or caterpillar), pupa, and finally the adult night-flying moth. The moths appear in September or October, lay eggs on and near iris plants which hatch in the spring as larvae.

The larvae feed on new growth, bore into leaf sheaths and eat their way into the base and rhizome. In late summer the larvae leave hollowed out rhizomes and pupate in the nearby soil. The moths emerge in about a month beginning a new cycle of life and iris destruction.

There are four principal methods for controlling the iris borer: the practice of garden hygiene especially in the spring and autumn, use of pesticides, particularly Cygon 2E, introduction of beneficial nematodes into the soil, and physical search and destroy methods. Cygon 2E is being removed by the United States EPA from use by nurseries, homeowners and other growers.

Garden hygiene practice involves spring and fall garden clean-up, physical removal of any larvae found, squeezing of leafs where there is evidence of boring or

mining in leaf sheaths. If larvae have tunnelled from the base into the rhizome, the plants must be dug up, the rhizomes examined, and any borers or rot caused by them removed by cutting away. The rhizome is then left in the sun to dry and scab over for several days. Before replanting in the soil, the planted area must be sifted by hand to remove any borers or pupae. Following this treatment, the transplanted rhizomes may not bloom for one or two years. This practice is neither a satisfactory nor complete means of control.

Iris growers use Cygon 2E (dimethoate) pesticide as the standard recommended chemical for killing borers and their larvae. Dimethoate is a powerful chemical and only is effective for ten days to two weeks in the spring. After that point the borers are beneath the ground and so large that no reasonable chemical control is effective. Chemicals will have no effect on borers that have penetrated iris rhizomes.

Dimethoate is highly toxic and kills beneficial as well as undesirable organisms. It is classified by the EPA as a group 3 carcinogen. By agreement of the EPA and the manufacturer, dimethoate will not be re-registered by the EPA pesticide review program for residential use.

Nematodes are used to find and destroy borers, however, nematodes themselves must be controlled since high populations retard healthy plant growth. Nematode controls are chemical as well as biological and are considered unsatisfactory in presenting a new set of problems including chemical contamination and expense.

In another aspect, the invention is directed to animal control particularly control of deer, elk, squirrels, chipmunks, rodents, rabbits and other warm-blooded mammals. In recent years animal population has grown to a point as to be present in significant numbers. These animals are considered pests when they feed on ornamental and other plants, trees, bulbs, seed and rhizomes and non-food crops cultivated with considerable investment in plants, equipment and labor.

The present invention utilizes methyl nonyl ketone as active ingredient in achieving insect and animal control. Methyl nonyl ketone (known also as undecanone-2) is a well-known insect repellent, insecticide, and animal repellent being disclosed in prior United States patents, and registerable for use as a pesticide by the United States Environmental Protection Agency. U.S. Patent No 4,555,015 to Haase discloses methyl nonyl ketone applied to plastic film bags as an animal repellent. U.S. Patent No

4,775,532 to Clayton discloses methyl nonyl ketone carried by dialkyl adipate for use as an animal repellent. U.S. Patent No 3,474,176 to Freeman discloses methyl nonyl ketone admixed with isopropanol, and also admixed with petroleum distillate and polyethelene glycol emulsifier with each mixture used as an animal repellent spray from a pressurized aerosol dispensing container. U.S. Patent No 2,283,471 to Swaine discloses methyl nonyl ketone with benzene triethanolamine-oleate and water for use as an insecticide. U.S. Patent No 4,169,898 to Haase discloses methyl nonyl ketone mixed with 3-phenylpropenal for use as an animal repellent, particularly dogs and cats. U.S. Patent No 4,562,794 to Speckman discloses methyl nonyl ketone among other active ingredients dispensed by a device worn by an animal for dealing with ectoparasites. U.S. Patent No 4,338,352 to Allan discloses methyl nonyl ketone released from biodegradable, microporous structures such as never-dried wood pulp for use as a repellent. U.S. Patent No 6,001,874 to Veierov discloses a number of conventional "behavior interfering compounds" including methyl nonyl ketone applied by means of an agricultural oil.

Methyl nonyl ketone is highly effective as an insect and animal repellent, however, methyl nonyl ketone has a twelve-hour half-life and degrades rapidly under

exposure to ultraviolet light, water and oxygen, and by exposure to microbes in the soil. The present invention is directed to a concentrated water-based composition for stabilizing methyl nonyl ketone to substantially improve its usefulness as an insect and animal repellent and, by way of illustrative application, its usefulness in repelling iris borers. The invention also provides a method for insect and animal control in using the composition.

SUMMARY OF THE INVENTION

The compositions of this invention comprise an active ingredient, methyl nonyl ketone, dispersed in an water/polymer solution wherein when the composition dries leaving a polymer film, the polymer cross-links binding the active ingredient within the polymer film matrices. Polymers and combinations of polymers are chosen so as to determine both the amount of active and other ingredients trapped within the polymer film matrices, the rate of degradation of the polymer matrix which affects the rate of release of the active ingredient under various environmental conditions, as well as the flexibility of the polymer film. A solubilizer is selected to dissolve the active ingredient and to dissolve easily in water. A spreading agent soluble in the active

ingredient/solubilizer/ water mixture spreads the formulation evenly over an application surface preventing pockets of active ingredient from forming thereby ensuring a uniform dose. A bittering agent is also used in the formulation.

Compositions according to the invention are suitable for applying using conventional containers with manual dispensing pumps, aerial application, by means of power assisted spray mechanisms or soil drench methods.

In the method according to the invention, an active ingredient is mixed with solubilizer and environmentally soluble polymer or copolymer and with other ingredients to form a concentrated water-base composition. The concentrate is diluted for application to the area for insect and animal control, the spreading agent evenly distributes the composition over an application surface, the composition dries, the polymer or copolymer cross-links to form a flexible film having interstices, active ingredient is trapped in polymer film interstices, the polymer or copolymer film degrades under environmental influences, and the active ingredient and other ingredients are released to control insects or animals.

Specific examples are included in the following description for purposes of clarity, but various details can be changed within the scope of the present invention.

OBJECTS OF THE INVENTION

An object of the invention is to provide an insect repellent composition that is particularly effective in deterring insects including the iris borer in moth to pupae stages.

Another object of the invention is to provide a method for controlling insects and animals.

An object of the invention is to provide an animal control composition that is particularly effective in deterring animals including deer, elk, squirrels, chipmunks, rodents, rabbits, felines, canines and other warm-blooded mammals from browsing on shrubbery, and on ornamental plants and their germinated and ungerminated rhizomes, roots, bulbs, seeds, and tubers.

An object of the invention is to provide an animal control composition that is particularly effective in deterring canines and felines from areas to which the composition is applied.

Another object of the invention is to provide an insect and animal control composition having methyl nonyl ketone as an active ingredient.

Another object of the invention is to provide an insect and animal control composition for stabilizing and extending the useful lifetime of methyl nonyl ketone as the active ingredient.

Another object of the invention is to provide an insect and animal control composition in water based concentrate form.

Another object of the invention is to provide an insect and animal control composition of high efficacy and safety for applying from household containers, commercial spraying equipment, aerial application, and other home and agricultural application.

Another object of the invention is to provide an insect and animal control composition that is particularly effective in deterring rodents particularly squirrels, chipmunks, and rabbits from consuming food in bird feeding stations.

Other and further objects of the invention will become apparent with an understanding of the following detailed description of the invention or upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for detailed description to enable those having ordinary skill in the art to which the invention appertains to readily understand how to make and use the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred insect and animal repellent composition according to a preferred embodiment of the invention comprises active ingredient, solubilizer, spreading agent, bittering agent, diluent, and polymer.

The active ingredient is methyl nonyl ketone which has a useful life primarily limited by exposure to ultraviolet light and soil microbes, is chemically relatively stable although it can be oxidized, and is somewhat volatile.

A preferred solubilizer is polysorbate 20. Methyl nonyl ketone dissolves well in polysorbate 20, and a mixture of the two dissolves easily in water.

A preferred spreading agent is corn oil which is also soluble in the polysorbate/methyl nonyl ketone mixture. When diluted, the small amount of corn oil is still soluble in the mixture. The spreading agent ensures a uniform dose of dilute composition over an application surface.

A preferred bittering agent is sucrose octacetate. Other bittering agents such as denatonium benzoate and denatonium saccharide may be used.

Water is used as a diluent.

A polymer or mixture of polymers is selected according to the invention for cross-linking or curing to form interstices or a matrix within a three dimensional structure film which trap and protect methyl nonyl ketone from oxidation.

The polymer film acts as a physical barrier to soil microbes to some degree. Soil microbes will slowly degrade the polymeric film, and as the film degrades, the trapped methyl nonyl ketone is released. Environmental factors such as water, oxygen and ultraviolet light also degrade the polymer film again slowly releasing methyl nonyl ketone into the specific environment.

Some methyl nonyl ketone plates the outer surfaces of the polymer film and is available for immediate dispersal into the environment, and subsequently for immediate environmental degrading.

In sum, a polymeric film is selected to provide a cross-linked film with matrices of sufficient capacity for trapping and being plated by active ingredient to have solubility of the cured polymer, that is, susceptibility to

slow degradation by environmental factors including water, oxygen, UV light, and soil microbes.

A suitable polymer for a water based concentrate is a castor oil/isophorone diisocyanate (IPDI). Castor oil/isophorone diisocyanate is a polymeric material where two moles of castor oil are bound to one mole of isophorone diisocyanate. This copolymer is predominately used in facial cosmetics and as such has very low toxicity and irritation effects. The copolymer is oil soluble and disburses easily into corn oil which is used as a spreading agent. As the water diluted composition dries down, the copolymer is evenly dispersed over an application surface with the corn oil polysorbate mixture. At dry down, the copolymer forms a matrix that binds the active ingredient, methyl nonyl ketone within the copolymer interstices.

Suitable concentrate formulas in percent by volume comprise compositions of ingredients within the following ranges:

Solubilizer: Polysorbate 20 in a range of 1-60%, and preferably 58.1%;

active ingredient: Methyl Nonyl Ketone in a range of 1-40%, and preferably 32.0%;

polymerizing agent: castor oil/isophorone diisocyanate in a range of 2-12%, and preferably 7.8%;

spreading agent: corn oil in a range of 0.5-15% and preferably 2.1%; and

bittering agent: sucrose octacetate in a range of 0.01-5% and preferably 0.35%.

This formula is intended as a concentrate only and is to be diluted with water at a rate of fifteen (15) parts water to one (1) part concentrate. The concentrate has a specific gravity of 0.9831 and a pH of 7.5.

The composition is prepared by measuring solubilizer into a mixing tank, adding active ingredient, polymer, and spreading agent in that order then mixing until uniform.

Dilution of the concentrate formula at a rate of 15:1 concentrate to water yields a working formula of:

Solubilizer: Polysorbate 20 in a range of 0.625-3.75%, and preferably 3.63%;

active ingredient: Methyl Nonyl Ketone in a range of 0.001-2.5%, and preferably 2.00%;

polymerizing agent: castor oil/isophorone diisocyanate in a range of 0.125-1.25%, and preferably 0.49%;

spreading agent: corn oil in a range of 0.3125-0.9375% and preferably 0.13%; and,

bittering agent: sucrose octacetate in a range of 0.0000625-0.3125% and preferably 0.0233%.

diluent: water 93.40%

The formula is prepared as stated above.

The composition provides an insect repellent to treat bulbs and/or rhizomes to reduce insect damage to germinating bulbs and rhizomes and to treat ornamental plants to reduce or eliminate insect damage to these plants. The composition also provides a repellent for animals including deer, elk, squirrels, chipmunks, rodents, rabbits and other warm-blooded mammals from browsing on shrubbery, and on ornamental plants and their germinated and ungerminated rhizomes, roots, bulbs, seeds, and tubers.

The concentrate and dilute formulas according to the invention provide a non-flammable composition suitable for spraying by air for agricultural applications. The formulas are non-phytotoxic.

A composition prepared according to the invention is liquid and is applied using containers with a manual pump or automated. When sprayed onto plants, rhizomes, bulbs, seed and surrounding soil or onto ornamental plants the composition dries and a flexible polymer film forms and cures with active ingredient trapped in matrices of the polymer film and plated on the film. The plated

constituents including methyl nonyl ketone are available for immediate dispersal into the environment for deterring iris borers from the irises, or insects from non-food crops and ornamental plants, or deer, elk, squirrels, chipmunks, rodents, rabbits and other warm-blooded mammals from plants and the like, or canines and felines in areas controlled for their presence. The trapped constituents are gradually released from the polymer matrices as the film degrades under the influence of water, oxygen, ultraviolet light and soil microbes.

The method for controlling insects and animals according to the invention comprises the steps of selecting a polymer or copolymer for cross-linking to form a flexible, degradable film with interstices for trapping an active ingredient, mixing the polymer with a solubilizer, active ingredient, spreading agent and water, applying the mixture on an area to be controlled for insects and animals so as to evaporate the solvent, to cross-link the polymer, to trap the active ingredient in cross-linked polymer interstices, and to degrade the film gradually under environmental influences, and gradually to release the active ingredient to control insects and animals. The mixture can be applied by spraying, coating or any

convenient technique for administering the composition to an area to be controlled for insects and animals.

Various changes may be made to the method and composition embodying the principles of the invention. The foregoing embodiments are set forth in an illustrative and not in a limiting sense. The scope of the invention is defined by the claims appended hereto. In the appended claims the term polymer has reference to polymers, copolymers, and mixtures of polymers and copolymers.